

Application No. 10/615,627

Third Substitute Amendment Dated September 13, 2006

Reply to Office Action Dated February 1, 2006 and to Notices of Non-Compliant
Amendment dated May 11, 2006, July 3, 2006 and September 1, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions of claims in the application:

Listing of Claims:

Claims 1 through 63. (cancelled).

64. (currently amended) A method of applying coating liquid onto a surface of a web moving in a given direction, comprising:

introducing coating liquid under pressure onto a concave curved surface that curves toward the ~~moving surface~~ web surface and has a terminal portion spaced from and extending toward the web surface in the direction of movement of and at an acute angle to the web surface;

flowing the coating liquid along the concave curved surface to form a sheet of coating liquid on the curved surface, to subject the sheet of coating liquid to centrifugal force to concentrate coating liquid toward one side of the coating liquid sheet that is toward the concave curved surface, and to redirect the coating liquid sheet for flow in the direction of movement of the web surface; ~~and~~

directing the coating liquid sheet from the terminal portion toward and in the direction of movement of and at an acute angle relative to the web surface to contact the web surface with the one side of the coating liquid sheet that was toward the curved surface to apply onto the web surface a layer of coating liquid; and

doctoring the coating liquid on the web surface.

65. (previously presented) A method as in claim 64 wherein said directing step operates to contact the web surface with the one side of the coating liquid sheet that was toward the curved surface while maintaining an opposite side of the coating liquid sheet that was away from the curved surface out of substantial contact with the web surface.

66. (previously presented) A method as in claim 64, wherein said flowing and directing steps flow coating liquid along the concave curved surface and from the terminal portion such that upon the coating liquid flowing from the terminal portion, coating liquid at the one side of the coating liquid sheet flows substantially only toward the web surface and is contacted with and carried away on the moving surface.

67-68. (cancelled)

69. (previously presented) A method as in claim 64, including the step of flowing the coating liquid under pressure through a passage extending in a direction against the direction of movement of the web surface, said introducing step comprising flowing coating liquid from the passage under pressure onto the concave curved surface in a direction against the direction of movement of the web surface.

70. (previously presented) A method as in claim 64, wherein the concave curved surface curves in one direction only so that the sheet of coating liquid is always subjected to centrifugal force in one direction only.

71. (previously presented) A method as in claim 64, wherein the concave curved surface is bounded.

72. (previously presented) A method as in claim 71, wherein both the concave curved surface and the terminal portion are bounded and said flowing step flows coating along the bounded concave curved surface such that upon the coating liquid sheet flowing from the terminal portion, coating liquid at the one side of the coating liquid sheet flows substantially only toward the web surface and contacts and remains on the web surface.

73-74. (cancelled)

75. (previously presented) A method as in claim 64, wherein the concave curved surface is unbounded.

76. (previously presented) A method as in claim 64, wherein the concave curved surface has an arcuate extent of no more than about 90°.

77. (previously presented) A method as in claim 69, wherein said step of flowing the coating liquid from the passage onto the concave curved surface flows the coating liquid along a straight surface extending between the curved surface and the terminal portion.

78-79. (cancelled)

80. (previously presented) A method as in claim 64, wherein said introducing and directing steps flow coating liquid along the concave curved surface and from the terminal portion such that upon the coating liquid flowing from the terminal portion,

coating liquid at the one side of the coating liquid sheet flows toward the web surface without return to the terminal portion and is carried away on the web surface.

81. (previously presented) A method of applying coating liquid onto a surface of a web moving in a given direction, comprising:

flowing coating liquid along a flow path that includes a concave curved surface that curves toward the web surface and a terminal portion spaced from and extending toward the web surface in the direction of movement of and at an acute angle to the web surface;

forming the coating liquid flowing along the concave curved surface into a sheet of coating liquid on the concave curved surface to subject the sheet of coating liquid to centrifugal force to cause air that may be in the coating liquid sheet to move away from one side of the coating liquid sheet that is toward the concave curved surface and toward an opposite side of the coating liquid sheet that is remote from the concave curved surface and to cause coating liquid to move and concentrate toward the one side of the coating liquid sheet, the concave curved surface redirecting the coating liquid sheet for flow in the direction of movement of the web surface;

directing the coating liquid sheet from the terminal portion toward and in the direction of movement of and at an acute angle relative to the web surface to cause the one side of the coating liquid sheet that was toward the concave curved surface to have primary contact with and to apply onto the web surface a layer of coating liquid that is relatively free of air; and

doctoring the coating liquid on the web surface.

82. (previously presented) A method as in claim 81, wherein said flowing, forming and directing steps cause the one side of the coating liquid sheet that was toward the concave curved surface to have primary contact with the web surface while maintaining the opposite side of the coating liquid sheet that was remote from the concave curved surface out of substantial contact with the web surface.

83. (previously presented) A method as in claim 81, wherein said flowing, forming and directing steps flow coating liquid along the flow path and the concave curved surface and from the terminal portion such that upon the coating liquid sheet flowing from the terminal portion, coating liquid at the one side of the coating liquid sheet flows substantially toward the web surface and is contacted with and carried away on the web surface.

84. (previously presented) A method as in 81, wherein said flowing step comprises flowing coating liquid under pressure onto the concave curved surface.

85. (cancelled).

86. (previously presented) A method as in claim 81, wherein said step of flowing coating liquid along the flow path comprises flowing coating liquid in a direction against the direction of movement of the web surface prior to flowing the coating liquid along the concave curved surface.

87. (previously presented) A method as in claim 81 wherein said flowing step flows coating liquid along a flow path that includes a concave curved surface that is

immediately preceded by a straight section of the flow path and then curves in one direction only.

88. (original) A method as in claim 81, wherein the concave curved surface is bounded along an enclosed length of the flow path.

89. (previously presented) A method as in claim 81, wherein both the concave curved surface and the terminal portion are bounded along an enclosed length of the flow path and said flowing step flows coating liquid along the enclosed length of the flow path such that upon the coating liquid sheet being directed from the terminal portion, coating liquid at the one side of the coating liquid sheet flows substantially toward the web surface and contacts and remains on the web surface.

90. (previously presented) A method as in claim 89, wherein said flowing step comprises flowing coating liquid under pressure onto the concave curved surface.

91. (cancelled)

92. (original) A method as in claim 81, wherein the concave curved surface is unbounded along an unenclosed length of the flow path.

93. (original) A method as in claim 81, wherein the concave curved surface has an arcuate extent of no more than about 90°.

94. (original) A method as in claim 81, wherein said step of flowing the coating liquid along the flow path flows the coating liquid along a straight surface of the flow path extending between the curved surface and the terminal portion.

95. (previously presented) A method as in claim 81, wherein said step of flowing the coating liquid along the flow path flows the coating liquid along a straight surface of the flow path immediately prior to the curved surface and the terminal portion.

96. (previously presented) A method as in claim 81, wherein the curved surface curves in one direction only.

97. (previously presented) A method as in claim 81, wherein said flowing, forming and directing steps flow coating liquid along the flow path and the concave curved surface and from the terminal portion such that upon the coating liquid sheet flowing from the terminal portion, coating liquid at the one side of the coating liquid sheet flows from the terminal portion to the web surface without return to the terminal portion and is carried away on the web surface.

98. (currently amended) A method of applying coating liquid onto a surface of a web moving in a ~~give~~ given direction, comprising:

flowing coating liquid along an elongate bounded concave curved surface that is positioned proximate to, spaced from and transversely of the web surface to subject the coating liquid to centrifugal force that causes air that may be in the coating liquid to move away from the concave curved surface and coating liquid to move and concentrate toward the concave curved surface; and

directing the coating liquid, after it has flowed along the curved surface, in a free standing elongate jet curtain of coating liquid toward, across and against the web

surface to contact the web surface primarily with one side of the jet curtain of coating liquid that was toward the curved surface to apply an excess layer of coating liquid onto the web surface.

99. (previously presented) A method as in claim 98, wherein said directing step operates to contact the web surface primarily with the one side of the jet curtain of coating liquid that was toward the curved surface while maintaining an opposite side of the jet curtain of coating liquid that was remote from the curved surface out of substantial contact with the web surface.

100. (previously presented) A method as in claim 98, wherein said flowing and directing steps operate such that upon the coating liquid being directed in an elongate jet curtain toward, across and against the web surface, the coating liquid at the one side of the jet curtain of coating liquid travels substantially toward the web surface and flows against and is carried away on the web surface.

101. (previously presented) A method as in claim 98, including the step of doctoring coating liquid on the surface of the web.

102. (cancelled)

103. (previously presented) A method as in claim 98, wherein said flowing and directing steps operate such that, upon the jet curtain of coating liquid being directed toward the moving surface, coating liquid at the one side of the jet curtain of coating liquid flows substantially toward the moving surface and flows against and remains on the moving surface.

104. (previously presented) A method as in claim 103, including the step of doctoring the excess layer of coating liquid on the surface of the web.

105. (cancelled)

106. (currently amended) A method as in claim 98, wherein said flowing step comprises delivering coating liquid under pressure to an elongate outlet nozzle, emitting the coating liquid from the elongate outlet nozzle in an elongate sheet of coating liquid, and flowing the elongate sheet of coating liquid emitted from the outlet nozzle along an elongate straight surface and then under pressure off of the straight surface and onto ~~and onto~~ and along the elongate curved surface to subject the coating liquid sheet to centrifugal force.

107. (original) A method as in claim 98, including the step, performed prior to said flowing step, of causing the coating liquid to flow through an air removal device that removes from the coating liquid an amount of entrained air.

108. (original) A method as in claim 98, wherein the curved surface has an arcuate extent of no more than about 90°.

109. (original) A method as in claim 98, wherein the curved surface has a radius in the range of about 0.125 inch to 0.500 inch.

110. (cancelled).

111. (previously presented) A method as in claim 98 wherein said flowing step comprises flowing coating liquid along a straight surface immediately prior to flowing

the coating liquid along the concave curved surface and the concave curved surface curves in one direction only.

112. (cancelled)

113. (previously presented) A method of applying coating liquid onto a surface of a web moving in a given direction, comprising:

flowing coating liquid along a flow path that includes a generally straight section immediately upstream from at least one portion of the flow path that changes in direction in one direction only and leads to a terminal portion of the flow path spaced from and extending toward the web surface in the direction of movement of and at an acute angle to the web surface;

forming the coating liquid flowing along the flow path into a sheet of coating liquid on the at least one portion to subject the coating liquid sheet to centrifugal force to cause coating liquid to concentrate toward one side of the coating liquid sheet; and

directing the coating liquid sheet from the terminal portion toward, in the direction of movement of and at an acute angle relative to the web surface to cause the one side of the coating liquid sheet to have primary contact with and to apply onto the web surface a layer of coating liquid.

114. (previously presented) A method as in claim 113, wherein said flowing step flows the coating liquid along a flow path in which all portions of the flow path are either straight or change in direction in one direction only so that the coating liquid

sheet is subjected to centrifugal force that causes coating liquid to concentrate only toward the one side of the coating liquid sheet.

115. (original) A method as in claim 113, wherein said flowing step flows the coating liquid along a flow path in which the at least one portion of the flow path is at least one curved portion of the flow path.

116. (previously presented) A method as in claim 113, wherein said flowing, forming and directing steps operate such that upon the coating liquid sheet flowing from the flow path terminal portion, coating liquid at the one side of the coating liquid sheet flows substantially toward the web surface and is contacted with and carried away on the web surface.

117. (previously presented) A method as in claim 116, including the step of doctoring coating liquid on the web surface.

118. (cancelled)

119. (previously presented) A method as in claim 116, wherein said flowing step flows the coating liquid along a flow path in which the at least one portion of the flow path is at least one curved portion of the flow path.

120. (original) A method as in claim 119, wherein the at least one curved portion of the flow path is at least one concave curved portion of the flow path.

121. (previously presented) A method as in claim 120, wherein the at least one concave curved portion and the terminal portion are bounded within an enclosed length of the flow path and said flowing step flows coating liquid along the enclosed

length of the flow path such that, upon the coating liquid sheet being directed from the flow path terminal portion, the one side of the coating liquid sheet flows substantially toward the web surface and contacts and remains on the web surface.

122. (previously presented) A method as in claim 120, wherein the at least one concave curved portion and the terminal portion are unbounded within an unenclosed length of the flow path.

123. (cancelled)

124. (previously presented) A method as in claim 113, including the step of doctoring the layer of coating liquid on the web surface.

125. (cancelled)

126. (previously presented) A method as in claim 113, wherein said flowing step flows coating liquid under pressure along the generally straight section and onto the at least one portion of the flow path.